Incorporating Academic Blogging into a Fifth Grade Classroom: Integrating Science and Technology into Literacy Instruction

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Abstract

There is a growing need to better prepare students for twenty-first-century literacy demands. Integrating technology into education improves student achievement and increases students' technological literacy. Classroom blogging is one way to provide students authentic experiences with technology while integrating literacy. The goal of this project was to examine fifth graders' interactions with text, fifth graders' perceptions of academic blogging, and science content integration in literacy instruction. Over the course of seven weeks, students participated in shared reading lessons and blogging sessions. Data was collected on students' acquisition of science content knowledge, students' interactions with text, and students' perceptions of technology integration. Findings revealed that students reported positive experiences with text when using technology, and students' knowledge of science content increased.

Introduction

According to Murnane, Sawhill, and Snow (2012), literacy is a prerequisite for success in the twenty-first century. Today's knowledge-based economy, rapidly advancing technology, and the complex social and political challenges facing the nation contribute to more advanced literacy demands than ever before (Murnane et al., 2012). Students need to be prepared for these increased literacy demands. One way to prepare them is to integrate literacy in science content area instruction, which has been shown to benefit both students' literacy skills and their scientific understanding (Cervetti, Barber, Dorph, Pearson, & Goldschmidth, 2012; Guthrie, McRae, & Klauda, 2007; Romance & Vitale, 2012; Textual Tools Study Group, 2006; Varelas, Pappas, & Rife, 2006; Worth, 2006). Another method to help students meet higher literacy expectations is to incorporate technology in literacy instruction. Not only does this support students' construction of advanced literacy skills and higher-order thinking skills; it also allows opportunities for students to gain needed technological experience. Specifically, incorporating blogging into the classroom is an authentic method to encourage higher-order thinking as well as conventional and technological literacy skill-building.

The goal of this project was to examine fifth graders' interactions with text, fifth graders' perceptions of academic blogging, and science content integration in literacy instruction. Students participated in shared reading lessons, science and reading minilessons, and blogging sessions. Data was collected on the content of students' blog posts, student perceptions of technology integration, and science content growth over the course of the project.

Literature Review

This section will provide a review of related literature regarding the definition of literacy, the importance of literacy in today's world, the integration of literacy in science content area instruction, the increase of technology usage in the classroom, the changing definitions of literacy as a result of the rise of technology, the integration of technology into literacy instruction, and the use of blogging in classrooms.

Definition of Literacy

Literacy is a term that can be defined in many ways, but most researchers in the field of education agree that literacy is more than just the ability to decode words on a page. Griffo, Madda, Pearson, and Raphael (2015) define literacy as the requisite skills, strategies, and experiences that readers and writers use when interacting with text in the world. The National Council of Teachers of English (NCTE, 2013) says that literacy is a collection of cultural and communicative practices shared among sociocultural groups. Murnane, Sawhill, and Snow's (2012) definition of literacy is "the ability to use reading to gain access to the world of knowledge, to synthesize information from different sources, to evaluate arguments, and to learn totally new subjects" (p. 1).

Importance of Literacy

Murnane et al. (2012) state that literacy is a prerequisite for success in this century. The complex economic, political, and social challenges facing the nation demand more advanced literacy skills than ever before (Murnane et al., 2012). Global communication, rapidly advancing technology, and a knowledge-based economy contribute to this demand. According to the International Society for Technology in Education (ISTE, 2018a), because of ever-changing technology impacting the way we live, work, and communicate, educators are preparing students

for a future world and future careers that are currently unimaginable. As a result, teachers are having to adapt to these ever-changing technologies as they work to prepare students to meet the increasing demands. The Common Core State Standards for English Language Arts have increased expectations for higher-order processes such as close reading of challenging texts to identify essence and nuance, writing from text-based sources, and constructing and critiquing arguments (Griffo et al., 2015). This has caused much debate in the educational world about how students will be supported in meeting the demands of more challenging texts (Griffo et al., 2015).

Integrating Literacy in Science Content Area Instruction

One way to help support students in meeting higher literacy expectations is through content-area integration. Integrating literacy into content-area instruction has been shown to benefit students' literacy skills (Cervetti et al., 2012; Guthrie et al., 2007; Romance & Vitale, 2012; Textual Tools Study Group, 2006; Varelas et al., 2006; Worth, 2006). Guthrie et al. (2007) found that incorporating reading and writing instruction in disciplinary studies led to improvements in students' reading comprehension, reading strategy use, reading fluency, word recognition, and reading motivation. In another study, seventh grade students received instruction in literacy strategies such as word maps and perspective-taking during science instruction (Textual Tools Study Group, 2006). Results indicated that applying these literacy strategies in a science setting motivated students to read, allowed teachers to model independent reading strategies and metacognition, and allowed students to have in-depth discussions about key words and concepts, leading to increased reading comprehension (Textual Tools Study Group, 2006). Further, a study by Varelas et al. (2006) revealed that second grade students who engaged in read alouds during science instruction experienced improvements in comprehension.

The read alouds utilized informational texts and were dialogically-oriented, so the teacher and the students shared the role of making meaning. The students in this study made several connections to other texts, personal experiences, and previous discussions. This allowed students to develop a deeper understanding of scientific concepts and scientific language.

In addition to science-literacy integration having strong literacy benefits, it has strong science content-area benefits as well. In a study conducted by Cervetti et al. (2012), researchers compared students who were taught science and literacy separately with students who were taught science and literacy in an integrated unit that included reading text, writing notes and reports, and frequent discussion of key concepts and processes. The researchers found that the students who were taught using the integrated science-literacy unit made significantly greater gains in science understanding, science vocabulary, and science writing (Cervetti et al., 2012). In a similar study, Romance and Vitale (2012) examined students who were taught using a model that included concept-focused science teaching, reading, writing, and the construction of concept maps based on reading. The researchers found that, when compared to similar students, students taught using Romance and Vitale's (2012) model had greater science and reading achievement, more positive attitudes toward both reading and science, and more self-confidence in reading and science.

Technology in the Classroom

The rise of technology in schools is undeniable. One-to-one technology programs, which involve schools providing every student with a mobile electronic device, are developing at a rapid rate across the country (Futuresource, 2018; U.S. Department of Education; 2017). In 2012, 23% of American K-12 students had access to a school-issued personal device through one-to-one initiatives (Futuresource, 2018). This percentage increased to 46% in 2015, an increase of

100% over the course of 3 years. According to Futuresource (2018), this increase is likely driven by the technology requirements associated with the Common Core State Standards and the overall move to online assessments. According to the U.S. Department of Education (2017), an increasing number of school districts are adopting web-based productivity tools and digital learning content. The Center for Digital Education and the National School Boards Association annually invite American school districts to respond to the Digital School Districts Survey, which examines the use of information technology in schools (Center for Digital Education, 2013). According to the results of this survey, 52% of responding school districts in 2010 had an information technology strategic plan and articulated that information technology needed to be more of a district priority (Center for Digital Education, 2010). Several districts have since prioritized technology, as 59% of districts had a digital content and curriculum strategy in place in 2015, which then increased to 62% in 2017 (Center for Digital Education, 2016; 2017). Specifically, many school districts are accepting the use of mobile devices for educational purposes (Center for Digital Education, 2016; 2017). According to the results of the Digital School Districts Survey, the percentage of school districts that reported having a strategy in place for incorporating mobile devices had increased from 74% in 2015 to 88% in 2017 (Center for Digital Education, 2016; 2017). In 2017, 54% of responding school districts even provided their own mobile app to students (Center for Digital Education, 2017). Schools' wireless internet access and connectivity has also increased in recent years, providing more students with access to digital tools (Consortium for School Networking, School Superintendent's Association, & Dun & Bradstreet, 2014; EducationSuperHighway, 2017; U.S. Department of Education, 2017). According to EducationSuperHighway (2017), K-12 bandwidth has been growing at an annual rate of 50%. In 2014, 25% of school districts reported in the Consortium for School Networking

(CoSN) Annual E-rate and Infrastructure Survey that no schools in their district could meet the Federal Communications Commission's connectivity goal of 100 Megabits per second per 1,000 students (CoSN et al., 2014). By comparison, in 2017, 88% of districts reported that at least 75% of their schools had achieved this connectivity goal (U.S. Department of Education, 2017).

Due to rapid advances in technology that change the way we work and live, educators are preparing students for a future world that is unimaginable (ISTE, 2018a). Rather than "using digital tools to support outdated education strategies and models," the ISTE (2018a) advocates for thoroughly integrating technology in the classroom to "amplify human capacity for collaboration, creativity, and communication" and to provide "young people worldwide with equitable access to powerful learning opportunities" (para. 2). It is critical to provide students with the skills to become lifelong learners and to face future challenges resourcefully and creatively (ISTE, 2018a).

Changing Definitions of Literacy

Literacy is changing with society and technology. Digital, multimodal text forms now accompany print-based literacy practices (Griffo et al., 2015). According to the NCTE (2013), "Because technology has increased the intensity and complexity of literate environments, the twenty-first century demands that a literate person possess a wide range of abilities and competencies, many literacies… [that] are multiple, dynamic, and malleable". In order to learn effectively and live productively in an increasingly global and digital world, students must learn to take some responsibility for their own learning, to critically evaluate information sources, to analyze and synthesize multiple streams of simultaneous information, and to communicate and collaborate with others using a variety of tools (ISTE, 2016, 2018a; NCTE, 2013). A recent definition of "modern literacy" includes the ability to read and produce media in the form of web

pages, blogs, social networking sites, or multimedia presentations (Roe & Smith, 2015). Schools need to prepare students for the new literacies that come with the continuously emerging set of new technologies by integrating them into the curriculum (Zawilinski, 2009).

Integrating Technology into Literacy Instruction

Technology can be integrated into literacy instruction to increase work on technological and literary skills while providing students with opportunities for higher-order thinking. McKenna et al. (2011) advocate for a seamless placement of computers into the mainstream of classroom literacy activities because computer skills are easily transferable to literacy skills. They propose a system where students critically discuss the computer applications they use, similar to critically analyzing conventional print materials. This model of technological integration allows students to work on higher-order thinking skills, technological literacy, and conventional literacy simultaneously. Mckenna et al. (2011) also support the inclusion of word processing throughout the writing process to emphasize the idea that writing, especially electronic writing, is never a final product and is always subject to improvement. Roe and Smith (2012) identified several specific language arts skills that can be practiced through the use of technological applications in classrooms; these language arts skills include listening, speaking, reading, writing, viewing, and visually representing.

Studies have shown that using technology also increases students' motivation to complete academic tasks (Kamil, Mosenthal, Pearson, & Barr, 2000; Mckenna et al., 2011; Roe & Smith, 2015). In a study conducted by Scott, Kahlich, & Barker (1994), elementary and middle school students identified as "at-risk" participated in a literacy club that included the use of computers to complete literacy activities. The results indicated that computer use in academics leads to increased motivation, especially when students are given the opportunity to customize their work

and increase their control over a task. For example, students could be motivated by their ability to select their own e-book or text size, or by their ability to customize their font size and color when typing. Roe and Smith (2015) provide several methods of using technology to effectively enhance students' motivation and higher-order thinking skills, such as developing podcasts, blogging, or composing emails to discuss a book. These are examples of authentic literacy activities that would allow students to simultaneously build traditional and technological literacy skills.

The Use of Blogging in Classrooms

Zawilinski (2009) defines a blog as "an easily editable webpage with posts or entries organized in reverse chronological order" (p. 650). Classroom blogging prepares students for the new literacies of the Internet while integrating writing to support reading (Zawilinski, 2009). Classroom blogging aligns with the ISTE's set of standards for educators. For example, one of ISTE's (2018b) standards states, "Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning" (Indicator 5b). Zawilinski (2009) points out that blogging also aligns with several common literacy standards, such as gathering and evaluating data from a variety of sources, reading a wide range of print and non-print texts, and employing a wide range of writing strategies to communicate with different audiences for different purposes. Kreul states that perhaps the greatest advantage to academic blogging is the authentic audience for student writing, since their written work can be viewed by others online (as cited in Zawilinski, 2009).

While integrating reading comprehension and writing skills, blogging also emphasizes higher-order thinking skills like analysis, synthesis, and evaluation (Zawilinski, 2009). According to Roe and Smith (2015), teacher prompts on students' blogs can lead to an increase

in background knowledge, critical thinking, and evaluation and synthesis of information, which are all supportive of students' higher-order thinking. Blogs require students to question texts' content, think critically about the information presented, and consider multiple perspectives to decide which position they will take (Roe & Smith, 2015). In summary, blogs offer students opportunities for higher-order thinking, critical thinking, taking multiple perspectives, and problem-solving, all within the context of writing for an authentic audience.

Summary

A traditional definition of literacy is the ability to use reading to gain access to knowledge, synthesize information, and evaluate arguments (Murnane et al., 2012). As rapidly advancing technology changes the workforce, more advanced literacy skills are in demand, and these higher literacy expectations are reflected in state standards. One way to support students in meeting these higher expectations is through science-literacy integration, which has been shown to have both strong literacy and science content-area benefits. Technology is on the rise in schools across America, with more school districts prioritizing the use of technology and the Internet for educational purposes. Due to this increase in technology use, definitions of literacy are changing to include multimodal text forms and a wide range of competencies (Griffo et al., 2015; NCTE, 2013). One such definition of "modern literacy" is the ability to read and produce media in the form of blogs, social networking sites, or multimedia presentations (Roe & Smith, 2015). Schools can prepare students for these new literacies by integrating technology into literacy instruction, which can simultaneously increase technological, literacy, and higher-order thinking skills. One such way to achieve technology-literacy integration is through academic blogging, which allows students to authentically practice higher-order thinking, critical thinking, reading comprehension, writing, and technological skills.

Methods

The purpose of this study was to examine fifth graders' interactions with text, fifth graders' perceptions of academic blogging, and science content integration in literacy instruction. For this study, fifth-grade students participated in shared reading lessons, science minilessons, and blogging sessions over the course of seven weeks. This section presents the methods used to investigate the research questions. It includes information describing the participants, the setting of the project, materials used during the study, methods used for data collection, the data analyses that were conducted, and the specific procedures used throughout the study.

Participants

The participants in this study were 19 fifth-grade students. There were 11 female and 8 male students. Further information about the participants is displayed in Figure 1.

Student Number	Gender	Languages Spoken at Home	Push-in/pull-out instruction
1	F	English	
2	M	English, Spanish	
3	F	English	
4	F	English	
5	M	English	
6	F	English	pull-out reading instruction
7	F	English	
8	F	English	
9	F	Spanish	push-in instruction with English as a Second Language teacher, pull-out reading instruction
10	M	English	
11	M	English	
12	F	English	
13	M	English	
14	M	English	pull-out math instruction
15	F	English	
16	M	English	

17	M	English	
18	F	English	
19	F	English	

Figure 1. Contextual factors chart of participants in the study.

Setting

The study took place at a suburban public elementary school in the southeastern United States. The school district has a choice program, meaning that rather than assigning students to schools based on location, parents submit applications for their students to attend the school that best fits their needs. This particular school is a Center for Accelerated Studies, so all educators in the school are endorsed to teach Gifted and Talented students. Approximately 62% of the school's students receive free or reduced lunch. This school provides one-to-one technology for their students, meaning that each student has access to a laptop in the classroom.

Materials

The book selected for this project was J.C. George's (1992) *The Missing Gator of Gumbo Limbo* because the content aligned with 5th grade state science standards. Each student was provided a copy of this book to use throughout the project. The students blogged using Microsoft's OneNote program installed on the laptops provided to them by the school. The classroom's Promethean board was used to project pictures, prompts, and information. Project ideas were adapted from a variety of resources including a Teachers Pay Teachers resource created by Candy Coated Scientist (n.d.) called *Literature Study on The Missing 'Gator of Gumbo Limbo: Ecology, Environment, ELA.*

Data Collection

On the first day of the study, a four question pencil-and-paper pre-assessment of science content knowledge was administered (see Appendix A). The assessment was designed based on topics aligned with content in *The Missing Gator of Gumbo Limbo* and 5th grade state science

standards. These topics included biotic factors, food chains, pollution, and niches. At the end of the study, the aforementioned pre-assessment was re-administered as a post-assessment as a measure of science content knowledge growth.

The students' blogs were an important source of data. Students who were present for the entirety of the project blogged a total of 8 times (excluding the introductory blog), responding to the discussion prompts posted in OneNote. The blog prompts encouraged higher-order thinking, and were related to literary and/or scientific concepts. Blogging required students to make text-to-self and text-to-world connections, evaluate the fairness of textual events, use vocabulary words in context, present and support arguments, make predictions, and evaluate their own predictions.

In addition, at the end of the study, each student was individually interviewed using a nine-item questionnaire designed to glean information about their perceptions of blogging and technology integration (see Appendix B). Students were asked about their prior knowledge and/or experience with blogging, their enjoyment of blogging, their enjoyment of the book, what was easy and difficult about blogging, their thoughts on using technology to respond to the reading, what they learned from the experience, and what they would change about the project.

Data Analysis

The science content pre- and post-assessments were analyzed using Microsoft Excel. On each of these assessments, students received one point for each question they answered correctly. Excel was used to chart the questions each student answered correctly and incorrectly as well as each student's total number of points for each assessment. The difference between each student's pre-assessment score and post-assessment score was calculated. The number of students was recorded whose score displayed no change, whose score increased by 0.5 points, whose score

increased by 1 point, etc. The total number of points the whole class received per question was then calculated in order to make visible overall gaps in knowledge. To get a better understanding of students' thinking, common mistakes made by the students were noted (e.g., drawing the food chain backwards).

After each session of this project, the researcher recorded notes (i.e., the researcher's questions, students' questions and responses, goals for the next session, relevant student behaviors, pacing of session). Further, students' blogs were read, and tally charts were created from their responses and used to categorize student responses. For example, the researcher recorded the number of misconceptions about content, predictions that were un-prompted, personal connections to the text, and personal reflections on the story. This analysis created a useful record of each session. It helped the researcher identify trends in student responses and plan for future sessions.

To analyze the results of end-of-project questionnaires, the aforementioned tally chart method was used. For each question, different answers the students gave were listed and the number of students that gave similar responses was counted. The tally charts were then used to write a summary of student responses to each question, which showed how the majority of the class responded.

Procedures

This study consisted of 14 sessions over the span of 7 weeks. One to three sessions were conducted per week, depending on the classroom schedule. Each session lasted between 30-60 minutes. Prior to conducting this study, a OneNote Notebook was created using a new email address and Microsoft account that all the students would use to access OneNote. Within OneNote, a Notebook called "The Missing Gator of Gumbo Limbo Discussion" was created, and

then 20 sections were created within the Notebook titled using the researcher's and each of the students' names. Each student's section was protected with a student-specific password.

The first session of the study was used to collect pre-assessment data, build classroom community, introduce blogging, and provide the procedures for the project. After brief verbal introductions, a science pre-assessment was administered. Then the students logged into OneNote on their laptops using the class account information. Each student received their individual section password. The students were instructed to access the researcher's sample introduction blog post and to write their own response to the introductory prompt in their own section of OneNote. The session concluded with the introduction and distribution of J.C. George's (1992) *The Missing 'Gator of Gumbo Limbo*.

The subsequent sessions followed a predictable format. Prior to each shared reading session, the students discussed what they remembered from previous sections of the book and reviewed vocabulary words and scientific concepts students had learned in previous chapters. The researcher would then read the next section of the text aloud as students followed along in their individual copy of the book.

During the shared reading, the classroom's Promethean board was used to display photographs of important organisms (i.e. armadillos, hydrilla) and landforms (ie. solution pits, mangrove swamps) featured in the book that may have been unfamiliar to students. When these words were encountered while reading, students viewed the photograph and were provided relevant background knowledge. The researcher paused at predetermined points in each chapter to ask the students questions about Tier II words, characters' feelings and reasoning, and students' predictions, feelings, and thoughts about the book. After the shared reading, the students shared their predictions, summarized the reading in their own words, and discussed the

blog prompt in a whole-class setting. Next, the researcher either led a minilesson or instructed students to create a blog post using the discussion prompt.

After the end-of-chapter class discussion, the students logged into OneNote on their laptops. A new page containing the blog prompt had been created for each student. The blog prompt was read aloud and often displayed on the Promethean board. Students then typed their responses to the blog prompt. For example, one prompt was, “Are humans good or bad for the ecosystem? In what ways do humans affect the ecosystem? What are some ways YOU can improve the environment where you live?” When each student finished their blog, the researcher would provide immediate feedback on whether they responded to all parts of the prompt and explained their thinking clearly. While the researcher wanted students to respond to the specific prompt, she also encouraged students to write off-prompt about predictions, reflections, and personal connections they could make to the text.

The minilessons and activities were intended to improve students’ comprehension of the text and to increase students’ knowledge of the scientific concepts mentioned in the book. One of the activities designed to improve comprehension involved students drawing a picture of the book’s setting, since the Everglades setting was unfamiliar to many students. During one of the minilessons on scientific concepts, students used yarn to collaboratively create a “Web of Life” (American Museum of Natural History, n.d.) that simulated the effect of pollution on organisms in an ecosystem and prompted a discussion on food chains and pollution.

Results

The purpose of this study was to examine fifth graders' interactions with text, science content integration in literacy instruction, and fifth graders' perceptions of academic blogging. This section will present the results for each set of research questions through an examination of the students' blogs, the science pre- and post-assessments, and the end-of-project questionnaires.

Student Blogs

In the blogs, students responded to the text in six main ways: predicting, inferring, evaluating, making text-to-world connections, making text-to-self connections, and questioning. These responses all demonstrated higher-order thinking skills. Some of these responses were influenced by the blog prompt (and were therefore prompted) (see Figure 2), and some responses were uninfluenced by the blog prompt (and therefore unprompted) (See Figure 3).

There were 140 total prompted responses. Fifty-seven of these (40.7%) were predictions, 4 (0.03%) were inferences, 19 (13.5%) were evaluations, 30 (21.4%) were text-to-world connections, and 30 (21.4%) were text-to-self connections. No student asked a prompted question. This data shows that the most common response successfully encouraged by the blog prompts was predictions. This data is, of course, strictly limited by the questions asked in the blog prompts.

There were 135 total unprompted responses to the text. Of these unprompted responses, 38 (28.1%) were predictions, 29 (21.5%) were inferences, 20 (14.8%) were evaluations, 30 (22.2%) were text-to-world connections, 9 (0.07%) were text-to-self connections, and 9 (0.07%) were questions. This shows that the most common unprompted response to *The Missing 'Gator of Gumbo Limbo* was predictions. The data in Figure 3 indicates that students' unprompted responses to the text increased over the course of the project. Students did not begin to make

unprompted predictions in their blogs until Chapter 3 (the third blogging session). After the first appearance of unprompted predictions, the number of students including a prediction in their blog increased by 366% by the end of the project. Students' text-to-world connections, questions, inferences, and evaluations followed a similar pattern, with increases of 400%, 400%, 267%, and 120%, respectively. The exception to this pattern was students' text-to-self connections. The number of students making this type of response fluctuated between 0 and 3, with a mean of 1.13 and a peak in Chapter 2. This may have been due to the topics of the class discussions, which had more to do with text-to-self connections toward the beginning of the book. Overall, the increase in other higher-order responses to the text could also largely be attributed to the class discussions. Students often discussed their predictions, text-to-world connections, inferences, and evaluations as a class prior to blogging. Blogging may have provided students with an outlet to reflect on and add to those class discussions, writing about ideas that they agreed with as they constructed ideas of their own.

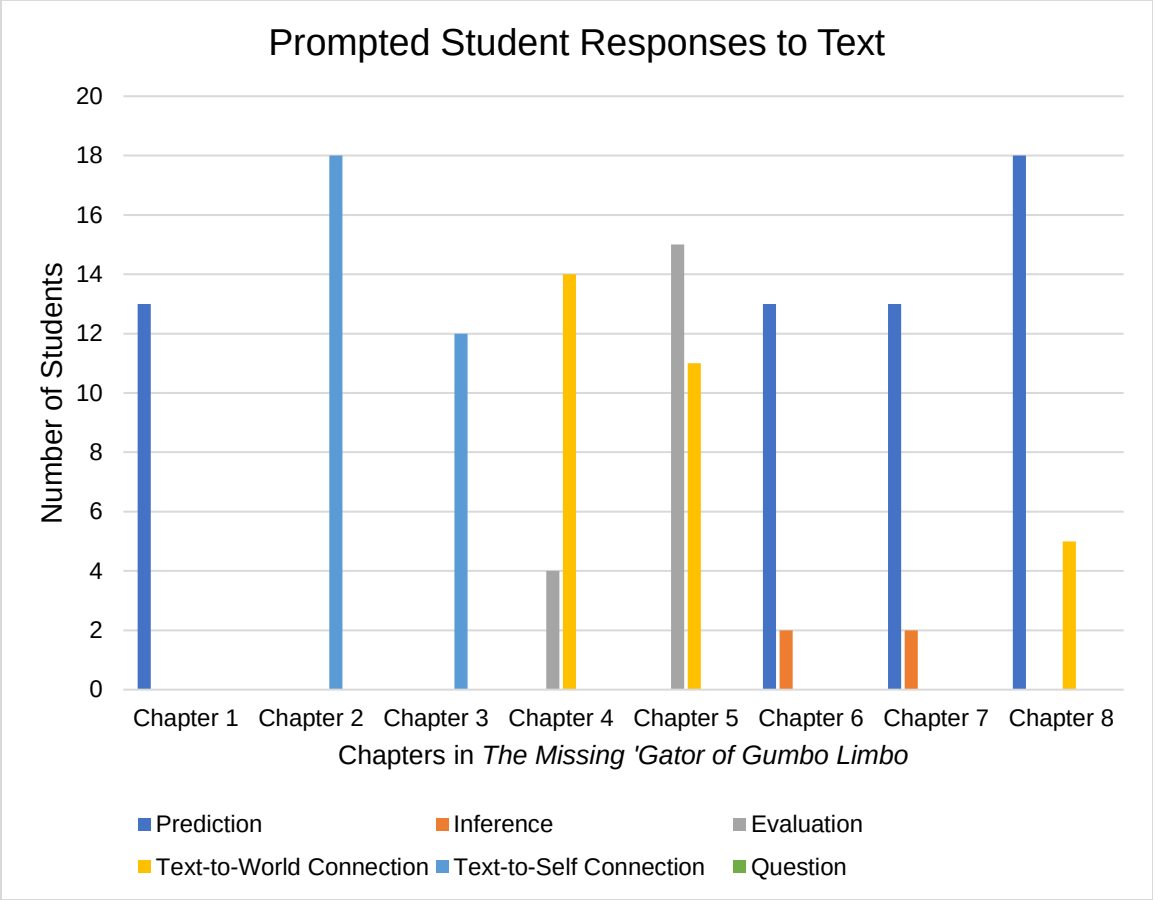

Figure 2. Prompted student responses to text (by type of response)

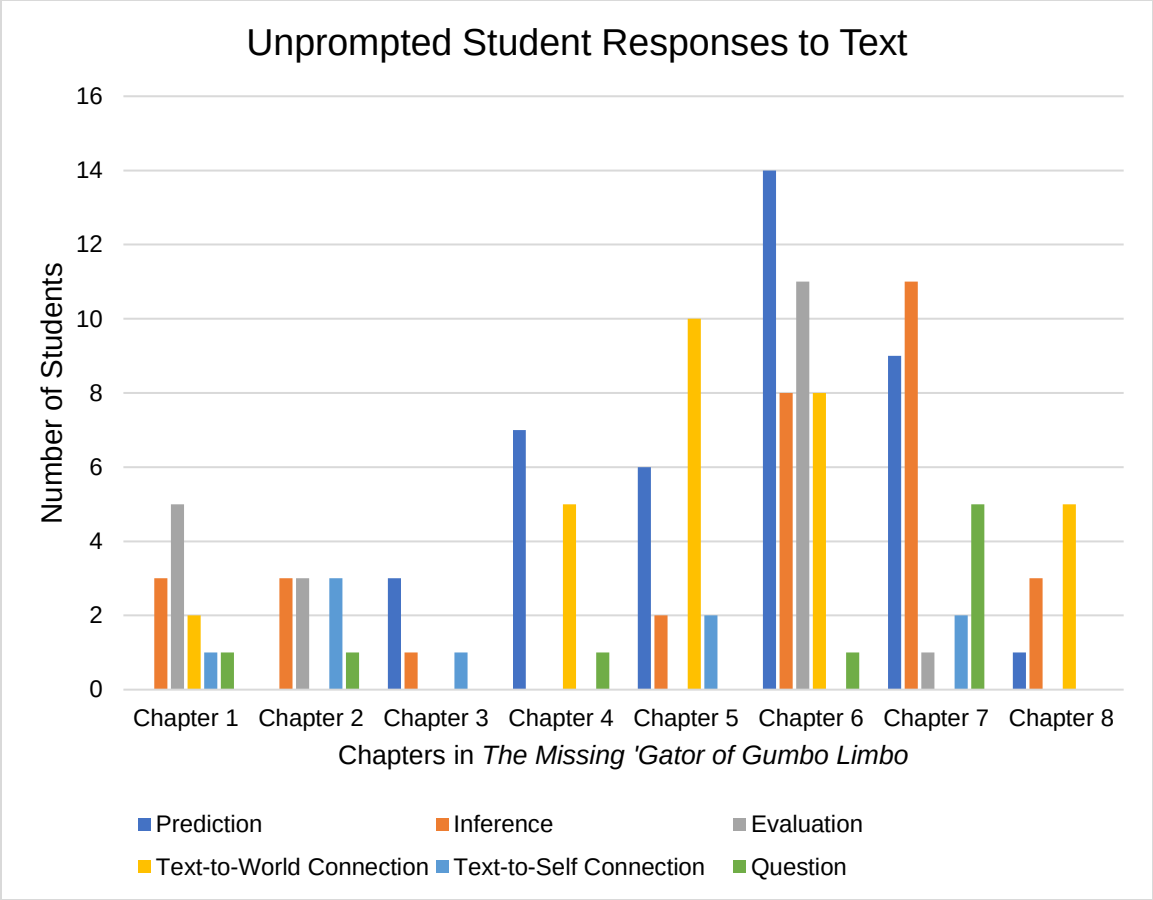

Figure 3. Unprompted student responses to text (by type of response).

Science Pre- and Post-Assessment

On the science pre-assessment, students answered an average of 1.25 out of 4 questions, or 31.25%, correctly. On the post-assessment, students scored an average of 3.14 out of the same 4 questions, which means they answered 78.5% of the questions correctly. Between the pre-assessment and post-assessment, the class's average score increased by 151.2%. Figure 4 shows the change in individual students' scores. No scores decreased; each student's score either increased or stayed the same. On average, students answered 1.39 more questions correctly on the post-assessment than on the pre-assessment. Of the 4 students whose score did not change from the pre-assessment to the post-assessment, 1 of these students scored a 4 out of 4 both times. While the other 3 of these students scored the same on both assessments, the questions

they answered correctly varied. For example, Student 2 answered only the food chain question correctly on the pre-assessment, but he only answered the biotic factors question correctly on the post-assessment. (Note: One student's science post-assessment score was not used in any of the previously mentioned calculations because her pre-assessment data was not collected.)

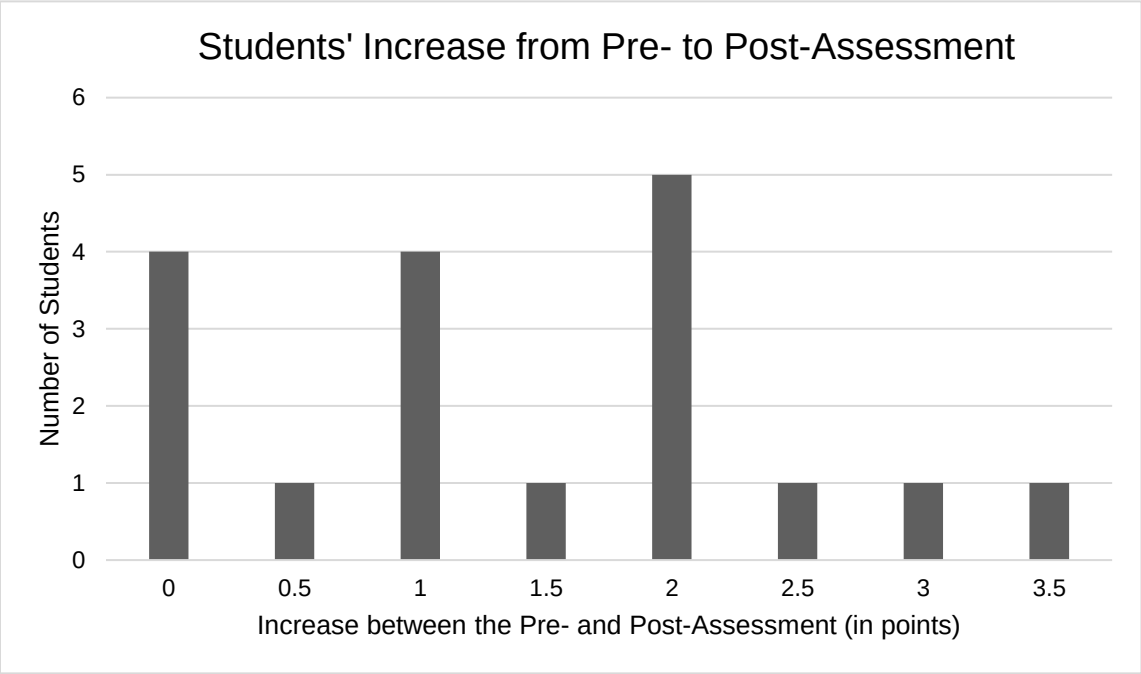

Figure 4. Students' increase in points from the pre- to post-assessment.

The number of students to answer each question correctly increased or stayed the same from the pre-assessment to the post-assessment (see Figure 5). For the biotic factors question, only 3 students out of 18 answered correctly on the pre-assessment, while 16 answered correctly on the post-assessment. According to this data, students' ability to correctly answer the biotic factors question increased by 433%. The food chain question had the same amount of students, 12, answer correctly on the pre-assessment as the post-assessment, although the 12 students who answered this question correctly were different on each assessment. 9 of these students consistently answered the question correctly, but 3 of the students who had answered it correctly on the pre-assessment answered it incorrectly on the post-assessment, while 3 other students did

the opposite. Interestingly, this was the only question where some students who answered it correctly on the pre-assessment then answered it incorrectly on the post-assessment. On the pre-assessment, the food chain question was the question with the most correct answers. This may be because food chains are included on third grade standards, so it was likely not the first time these students had interacted with food chains. On the pollution question, students received half credit if they correctly circled all of the organisms but then second-guessed themselves and erased some. On this question on the pre-assessment, 2.5 students answered correctly, and this number increased to 4.5 on the post-assessment. This was an increase of 80%. This question revealed possible misconceptions that pollution only affects animals or that pollution only affects aquatic organisms. The pollution question may have been poorly designed, since students are not accustomed to circling all of the options in a test question. This may account for the overall low scores on this question. On the niche question, 5 students out of 18 answered correctly on the pre-assessment, while 15 answered correctly on the post-assessment, revealing an increase of 200%. 2 of the 3 students who provided incorrect answers to this question were absent the day that the class discussed and blogged about niches. Overall, the data shows that students' ability to answer questions about biotic factors, pollution, and niches increased over the course of the project. The class's ability to answer questions about food chains generally stayed the same throughout the project, according to this data.

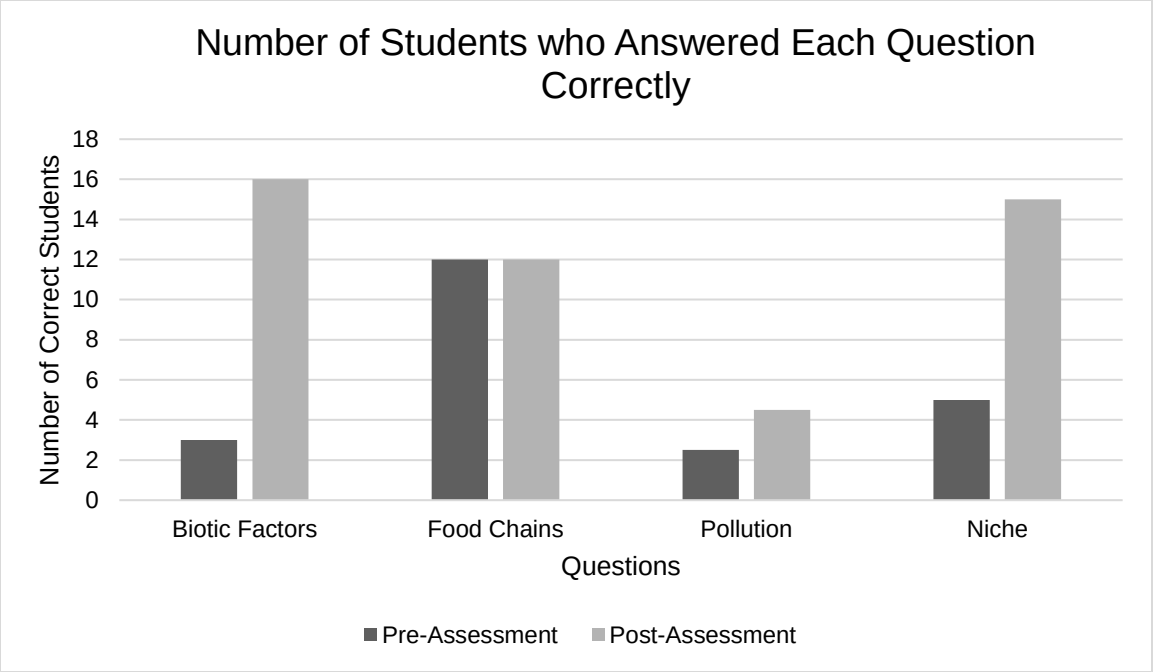

Figure 5. Number of students who answered each question correctly in the pre-assessment versus the post-assessment.

Student Questionnaires

The questionnaires were administered individually at the end of the project. They were designed to gather data about students' perceptions of blogging and technology integration (see Appendix B). Students were asked about their prior knowledge and/or experience with blogging, their enjoyment of blogging, what they found easy and difficult about blogging, their thoughts on using technology to respond to the reading, and what they learned from the project.

One item on the questionnaire asked students, "Before this project, how would you describe your knowledge/experience with blogging?" According to students' responses, none of the students had blogged before; 7 of the 18 students (38.88%) knew what blogging was prior to the project; 1 student (0.06%) previously had a misconception about what blogging was; 6 students (33.33%) had heard the word "blogging" before but did not know its meaning; and 4 students (22.22%) had never heard of blogging. Because only 7 students claimed to have

knowledge of blogging prior to this project, learning how to blog provided the other 11 students with an authentic experience that they could associate with the word "blogging." Since none of the students had prior experience with blogging, this project exposed the students to a form of communication that is growing more popular in our society.

The questionnaire also asked students about the difficulty level of blogging, and what aspects of blogging they found easiest and most challenging. The results are summarized in Figure 6. Many students reported that they found typing on their laptops to be easy but spelling to be difficult and frustrating. This is likely because the students were not as accustomed to typing on a computer as they were to typing on their smartphones. While smartphones typically utilize the same QWERTY keyboard as a laptop, they also use Autocorrect, a program that corrects spelling errors when typing. Students accustomed to Autocorrect would likely get frustrated if their spelling and typing errors were not automatically corrected when using a laptop.

Opinions on the ease of operating OneNote were mixed. One student said it was easy, but two mentioned that the process of logging into OneNote was cumbersome. This may have been due to the long loading time of the program and the frequently forgotten individual passwords. Two students mentioned that the introduction blog was easy. This was expected given that the introductory blog mostly featured questions about the students' hobbies and favorite things. Several students mentioned that answering the questions in the prompts was easy, while only one cited it as difficult. Whole class discussions probably assisted students in answering those questions. Students had mixed thoughts on predicting—three students said it was easy, and three students said it was difficult. Since the novel was a mystery, predictions were frequently discussed in a whole class setting. Some students may have thought of predicting as easy because

predictions were discussed at length, or because predicting seemed a natural part of the reading process of a mystery. While these could be reasons for finding predicting to be easy, these could just as well be reasons for finding predicting to be difficult. Since the class discussed so many possibilities of the solution to the mystery, students may have found deciding between the options to be difficult or overwhelming. Overall, students mentioned more aspects of blogging that were easy (23) than were difficult (14).

Students' Self-Reported Difficulty Level with Aspects of Blogging		
Aspect of Blogging	Number of Students Who Said the Aspect was Easy	Number of Students Who Said the Aspect was Difficult
Typing	8	*
Spelling	1	8
OneNote	1	2
Introduction Blog	2	*
Answering Questions	8	1
Predicting	3	3

* No students mentioned this aspect of blogging when asked what aspects were difficult.

Figure 6. Students' self-reported difficulty level with aspects of blogging.

When students were asked to rate their enjoyment of blogging on a scale of 1 to 5, all the students gave it a rating of at least 3. The number of students who gave blogging each rating are represented in Figure 7. The average rating of blogging was 4.32 out of 5. Students were also asked their reasoning for the ratings they provided. Negative comments included that spelling was difficult, that it was difficult to make sentences out of little information, that blogging took up a lot of time, and that blogging took a while to get used to. Positive comments included that it was enjoyable to express feelings through blogging, that it was fun to make predictions, and that blogging held students accountable for paying attention to the reading. The most popular

comment, given by seven students, was that typing and using laptops was fun. Three students mentioned that blogging was a different way to respond to text than they were accustomed to, and all three of these students rated blogging 5 out of 5, indicating that these students seem to appreciate different experiences with responding to text. Overall, the data suggests that students enjoyed the project and experiences with blogging.

Students' Enjoyment Rating of Blogging	
Rating	Number of Students
1	0
2	0
3	4
4	5
5	10

Figure 7. Students' enjoyment rating of blogging.

Students were also asked their thoughts on using technology to respond to the text. A vast majority of the students had positive views of the use of technology for this purpose. When asked this question, students frequently compared the use of technology to other common forms of responding to text—writing and speaking. Five students reported that they appreciate the change from handwriting textual responses. Five students reported that they find using technology to be easier and faster than writing. Three students mentioned that blogging allows you to have a record of your past textual responses, unlike speaking. One of these three students mentioned that blogging allowed her to see the "big picture" in the book and to make connections across chapters. Only one student in the class had negative views on this subject,

and he said it was because OneNote was difficult to use. Overall, the majority of the class ended the project with positive views on the use of technology to respond to text.

The questionnaire also asked students to name something they learned from the project. Because the question was vague, students' responses revealed what stood out to students the most from the entire experience. Eight students mentioned specific scientific facts that they learned. Specifically, students mentioned food webs, niches, algae, animals, and littering. Five students mentioned what they learned about blogging—that it is fun, that you have to answer all the questions on the prompt, that there are different types of blogging, that you have to try your best when blogging, and that he/she could start his/her own blog and have others contribute to it. Four students mentioned things they learned from the book about bravery and friendship. Based on this data, scientific facts were what stood out the most to the greatest number of students. Alternatively, the students may have answered this way because they are used to learning facts in content areas such as science rather than learning things about technology and literacy.

Summary

An analysis of the students' blogs revealed that the most common prompted and unprompted response to the book was predictions. The number of unprompted student-made predictions, text-to-world connections, questions, inferences, and evaluations increased over the course of the project. The class's average score on the science assessments more than doubled from the pre-assessment to the post-assessment, indicating that students' understanding of the scientific concepts present in the book increased overall. The questionnaires revealed that students enjoyed the experience of typing and using a laptop to respond to the text, although many found spelling to be challenging.

Discussion

This final section addresses implications of this study for practice, limitations of this study, and areas for future research. In addition, this section includes a summary of the study's purpose, procedures, and results.

Implications for Practice

This project supports the idea that science and literacy integration can be beneficial. Over the course of the project, students' understanding of scientific concepts increased. Science content instruction focused on the themes in *The Missing 'Gator of Gumbo Limbo*. Shared readings provided students with background knowledge on the scientific concepts, and book-centered science minilessons gave science a context with which students were familiar (e.g., discussing biotic factors that might be found in Gumbo Limbo Hole).

This study also suggests that technology integration in literacy, specifically through academic blogging, is beneficial. Students demonstrated increased use of higher-order thinking skills as the project progressed, responding to the text with more predictions, evaluations, questions, connections, and inferences. Predictions were the most common type of response to the text. If other students are also most comfortable with predictions, teachers could begin blogging projects by having students make predictions and gradually build students' comfort level with other types of responses. Students in this study found blogging enjoyable, giving it an average enjoyment rating of 4.32 out of 5, and many students mentioned their particular enjoyment of typing. Teachers could use students' enjoyment of blogging and typing to increase students' motivation and willingness to engage in reading and responding to text. Teachers could also use blogging to encourage students' attention in read-alouds or shared reading sessions. As one student said, "Blogging really held me responsible for paying attention to the book."

Teachers could also use blogging as a record of student thinking; similar to entries in a written journal, text responses in a blog can be easily compared over time. Since many students were frustrated with the spelling component of blogging, it may be helpful for teachers to provide a word bank or create a word wall of commonly used science- and book-related words.

Limitations

One challenge that was faced when completing this project was working with the classroom schedule. Thirty minutes to an hour was provided for each visit, but more time was necessary to talk about the reading and to allow the students to blog. The majority of the students did not have much experience with computers, so they typed slowly. Because of this, more time had to be allotted for blogging and less time for oral discussion. Because the lead researcher was a college student, coordinating college class schedules with the elementary class schedule meant that meeting times were not as flexible as was ideal. The elementary school rearranged field trip days, so some of the class's field trips fell on days that reading and blogging sessions were supposed to take place. This resulted in two fewer meeting times than were originally planned, meaning less time for minilessons, discussion, and blogging.

Another limitation of this project was student absences. Some students were frequently absent from school, and it was difficult to make up missed reading and blogging sessions. Two students often had pull-out reading interventions during the time the project was being conducted in the classroom. This resulted in these students often missing a section of a chapter or the entire read aloud and having less time to blog. Each time this happened, the students were given a brief summary of what they had missed in the chapter and were instructed to blog to the best of their ability.

Technology was a limitation in this project as well. Full access to the classroom's Promethean board or the ActivInspire technology associated with it was not provided. The host teacher would display any images emailed to her on the Promethean board, but her laptop was usually unavailable during the lessons. In addition, OneNote did not work every time on every computer. In these situations, students wrote their responses to the prompt on paper, though it was not ideal and did not include the technology integration essential to this project.

Future Plans/ Research

One of the items on the student questionnaire asked, "If you could change one thing about this project, what would it be?" A few students mentioned that eBooks could be used instead of paper books. Introducing students to digital books could help them get acquainted to interacting with text in a form that is growing in popularity, and it would be another way to use technology in the classroom. One student suggested vlogging (video blogging) instead of blogging. Rather than typing responses to the book, students would use a program such as iMovie to create an audiovisual recording of their responses. Although this would not directly integrate writing, teachers could assign a pre-video writing activity so that students are prepared to share their ideas in the recording. In addition to integrating technology into literacy instruction, vlogging would also be a creative way to integrate oral communication skills, which are emphasized in the Common Core State Standards. It would be interesting to compare the results between a class that responded to the text with blogging and another that responded with vlogging.

It would be interesting to perform this study again with the use of multiple classes or groups of students. One class would integrate technology into literacy instruction, another class would integrate science into literacy, another would integrate both technology and science into

literacy instruction, and a control group would not use integration in literacy instruction. Students' literacy, science, and technology growth would be assessed and compared across the four groups in order to determine the impact of integration in these areas.

If this project was conducted again, it would be beneficial to allot more time to discussion. Students would discuss the blog prompt in small groups prior to blogging, as a pre-writing activity. If possible, students would also use the blogs to respond to each other's thoughts and ask each other questions. This would build classroom community while increasing accountability and reading comprehension.

Conclusion

The purpose of this project was to incorporate academic blogging and science minilessons into fifth grade literacy instruction and to examine the students' perceptions of blogging and their interactions with text through blogging. Findings revealed that students' science content knowledge increased over the course of the project, students' use of higher order thinking skills increased, and students' perceptions of using technology to respond to text were positive. Based on the findings of this project, teachers could use academic blogging in the classroom to increase student motivation and to increase students' use of higher order thinking.

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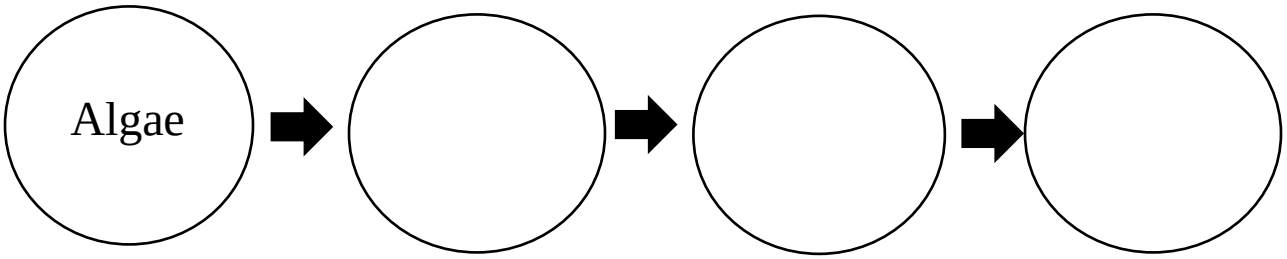
Appendix A- Science Pre- and Post-Assessment

Name: _____
Date: _____

1) Which of the following is a **biotic** factor of an ecosystem?
    a. A rock
    b. A tree
    c. Water
    d. Temperature
2) Arrange these organisms in a food chain in the correct order:
   Alligator, Fish, Egret



3) Circle all the organisms that can be affected by human pollution.

Fish Snake Grass Eagle Alligator Frog Tree

4) What is the definition of a niche?
    a. How humans affect an ecosystem
    b. An environment with organisms
    c. The role or job of an organism in an ecosystem
    d. A non-living part of an ecosystem

Appendix B- Student Questionnaire

1) Before this project how would you describe your knowledge/experience with blogging?

a) I had blogged before.
b) I knew what blogging was before.
c) I thought I knew what blogging was, but I was wrong.
d) I had heard the word “blogging” before.
e) No, I did not know what blogging was.
f) Other:

2) Did you enjoy blogging? Why or why not? Rate your experience.

1	2	3	4	5
☹		😐		☺

3) Did you enjoy *The Missing ‘Gator of Gumbo Limbo*? Why or why not? Rate your experience.

1	2	3	4	5
☹		😐		☺

4) Was anything easy for you when blogging?

5) Was anything difficult for you when blogging?

6) What did you think about using technology to respond to the reading?

7) What is one thing you learned from this experience?

8) If you could change one thing about this project, what would it be?

9) Do you have any other observations or reflections on this project?